

## WHAT IS CLAIMED:

1. In a sending station operable in a communication system to send data upon a communication channel susceptible to fading, an improvement of apparatus for placing the data in a form to facilitate communication thereof upon the communication channel, said apparatus comprising:

an encoder coupled to receive first values representative of the data to be communicated upon the communication channel, said encoder for encoding the first value representative of the data into encoded form, the encoded form forming a codeword of a recursive, systematic space-time code, and the codeword complying with an equal eigenvalue criterion .

2. The apparatus of claim 1 wherein said encoder comprises a first systematic recursive structure including a feedback path formed therein.

1           3. The apparatus of claim 1 wherein the codeword of the systematic space-time code,  
2        into which said encoder encodes the first values representative of the data, includes at least a  
3        systematic part, and wherein the systematic part is formed of untransformed values of the first  
4        values representative of the data.

1           4. The apparatus of claim 3 wherein the codeword of the systematic space-time code,  
2           into which said encoder encodes the first values representative of the data, is further formed of

1 parity values, the parity values derived from the first values representative of the data.

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1        5. The apparatus of claim 1 wherein the codeword of the systematic space-time code,  
2 into which said encoder encodes the first values representative of the data, includes parity values,  
3 the parity values being derived from the first values representative of the data.

16. The apparatus of claim 1 wherein the codeword of the systematic space-time code,  
17. into which said encoder encodes the first values representative of the data, comprises at least one  
18. systematic symbol value and at least one parity value.

1        7. The apparatus of claim 1 wherein the communication system comprises a radio  
2 communication system, wherein the sending station comprises a fixed-site transceiver, and  
3 wherein the codeword of the recursive, systematic space-time code constructed by said encoder is  
4 communicated by the fixed site transceiver upon a radio channel which forms the communication  
5 channel.

1 8. The apparatus of claim 1 wherein said encoder comprises a coset selecting coder

1       coupled to receive at least one of the first values, said coset selecting coder for producing coset  
2       addressing values.

1               9.       The apparatus of claim 8 wherein at least one part of the coset addressing values  
2       produced by said coset selecting coder comprises a parity value.

1               10.      The apparatus of claim 8 wherein at least one part of the coset addressing values  
2       produced by said coset selecting coder comprises a non-derived value.

1               11.      The apparatus of claim 8 wherein said encoder further comprises a signal entity  
2       selector coupled to said coset selecting coder, said signal entity selector for selecting a  
3       multidimensional constellation entity related to the coset addressing values produced by said  
4       coset selecting coder, a multi-dimensional constellation entity forming at least part of the  
5       codeword of the systematic recursive space-time code.

1               12.      The apparatus of claim 11 wherein said signal entity selector generates a binary  
2       representation of the multi-dimensional constellation entity.

1               13.      The apparatus of claim 11 wherein said signal entity selector is further coupled to  
2       receive at least one of the first values and wherein the multi-dimensional constellation entity  
3       selected at said signal entity selector is further related to the at least one of the first values.

1           14. The apparatus of claim 13 wherein the at least one of the first values to which said  
2       first signal entity selector is coupled to receive comprises a systematic part.

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4           15. In a method of communicating in a communication system having a sending  
5       station operable to send data upon a communication channel susceptible to fading, an  
6       improvement of a method for placing the data in a form to facilitate communication thereof upon  
7       the communication channel, said method comprising:

8               applying values representative of the data to be communicated upon the  
9       communication channel to an encoder;

10              encoding the values into encoded form, the encoded form forming a codeword of  
11       a recursive, systematic space-time code, and the codeword complying with an equal eigenvalue  
12       criterion.

1           16. The method of claim 15 wherein the codeword of the recursive, systematic space-  
2       time code formed during said operation of encoding comprises both untransformed values  
3       representative of the data to be communicated upon the communication channel and parity  
4       values, the parity values derived from the values representative of the data.

1           17. The method of claim 15 wherein said operation of encoding comprises the  
2       operations of:

3 selecting coset addressing values; and thereafter  
4 selecting a multi-dimensional constellation entity related to the coset addressing  
5 values, the multi-dimensional constellation entity forming at least part of the codeword of the  
6 systematic recursive space-time code.

18. The method of claim 17 comprising the additional operation of representing the  
multi-dimensional constellation entity in binary form.